What is Claimed Is:

1. A process for selectively hydrogenating a highly unsaturated hydrocarbon to a less unsaturated hydrocarbon in an olefin rich hydrocarbon stream comprising introducing into a reactor, from a fractionation tower, a hydrocarbon fluid stream comprising a highly unsaturated hydrocarbon in the presence of hydrogen and a catalyst composition under conditions effective to convert said highly unsaturated hydrocarbon to a less unsaturated hydrocarbon;

said catalyst composition comprising palladium, silver, potassium, and an inorganic support material, wherein the catalyst composition contains less than about 0.3 weight % potassium.

2. The process according to claim 1, wherein the potassium component is derived from potassium fluoride.

3. The process according to claim 2, wherein a molar ratio of potassium to fluoride is less than 2:1.

4. The process according to claim 2, wherein a molar ratio of potassium to fluoride is less than 2:1.

5. The process according to claim 1, wherein said catalyst composition contains less than 0.2 weight % potassium.

6. The process according to claim 4, wherein said catalyst composition contains 0.1 weight % potassium.

7. The process according to claim 1, wherein said silver is selected from the group consisting of silver oxide and silver metal.

8. The process according to claim 1, wherein said inorganic support material is selected from the group consisting of alumina, silica, titania, zirconia, aluminosilicates, zinc aluminate, zinc titanate, and mixtures thereof.

9. The process according to claim 8, wherein said inorganic support material is alumina.

10. The process according to claim 1, wherein the palladium content is 0.01-1 weight %, the silver content is 0.01-10 weight %, and the fluorine content is 0.01-1.5 weight %.

11. The process according to claim 10, wherein the palladium content is 0.01-0.2 weight %, the silver content is 0.02-2 weight %, and the fluorine content is 0.05-0.4 weight %.

12. The process according to claim 1, wherein said highly unsaturated hydrocarbon is selected from the group consisting of diolefins, alkynes, and mixtures thereof.

13. The process according to claim 12, wherein said diolefin is selected from the group consisting of propadiene, 1,2-butadiene, 1,3-butadiene, isoprene, 1,2-pentadiene, 1,3-pentadiene, 1,4-pentadiene, 1,2-hexadiene, 1,3-hexadiene, 1,4-hexadiene, 1,5-hexadiene, 2-methyl-1,2-pentadiene, 2,3-dimethyl-1,3-butadiene, heptadienes, methylhexadienes, octadienes, methylheptadienes, dimethylhexadienes, ethylhexadienes, trimethylpentadienes, methyloctadienes, dimethylheptadienes, ethyloctadienes, trimethylhexadienes, nonadienes, decadienes, undecadienes, dodecadienes, cyclopentadienes, cyclohexadienes, methylcyclopentadienes, cycloheptadienes, methylcyclohexadienes, dimethylcyclopentadienes, ethylcyclopentadienes, dicyclopentadiene, and mixtures thereof.

14. The process according to claim 13, wherein said diolefin is selected from the group consisting of propadiene, 1,3-butadiene, 1,3-pentadiene, 1,4-pentadiene, isoprene, 1,3-cyclopentadiene, dicyclopentadiene, and mixtures thereof.

15. The process according to claim 14, wherein said diolefin is propadiene.

16. The process according to claim 12, wherein said alkyne is selected from the group consisting of acetylene, propyne, 1-butyne, 2-butyne, 1-pentyne, 2-pentyne, 3-methyl-1-butyne, 1-hexyne, 1-heptyne, 1-octyne, 1-nonyne, 1-decyne, and mixtures thereof.

17. The process according to claim 16, wherein said alkyne is selected from the group consisting of acetylene, propyne, and mixtures thereof.

18. The process according to claim 1, wherein said process further comprises the presence of a sulfur impurity.

19. The process according to claim 18, wherein said sulfur impurity is a sulfur compound selected from the group consisting of hydrogen sulfide, carbonyl sulfide (COS), carbon disulfide (CS_2), mercaptans (RSH), organic sulfides (R-S-R), organic disulfides (R-S-S-R), organic polysulfides (R-Sn-R, n where >2), thiophene, substituted thiophenes, organic trisulfides, organic tetrasulfides, and mixtures thereof, wherein R represents an alkyl or cycloalkyl or aryl group containing 1 carbon atom to 10 carbon atoms.

20. A process comprising introducing into a reactor, from a depropanizer fractionation tower, a fluid stream comprising an alkyne and optionally a diolefin, in the presence of hydrogen and a catalyst composition, under conditions effective to convert said diolefin and alkyne to their corresponding monoolefins;

said catalyst composition comprises palladium, a silver component, a potassium compound, and an inorganic support material; wherein said catalyst composition contains less than 0.3 weight % potassium;

said diolefin is selected from the group consisting of propadiene, 1,3-butadiene, 1,3-pentadiene, 1,4-pentadiene, isoprene, 1,3-cyclopentadiene, dicyclopentadiene, and mixtures thereof;

said alkyne is selected from the group consisting of acetylene, propyne, 1-butyne, 2-butyne, 1-pentyne, 2-pentyne, 3-methyl-1-butyne, 1-hexyne, 1-heptyne, 1-octyne, 1-nonyne, 1-decyne, and mixtures thereof;

said inorganic support material is selected from the group consisting of alumina, silica, titania, zirconia, aluminosilicates, zinc aluminate, zinc titanate, and mixtures thereof.

21. The process according to claim 20, wherein a molar ratio of potassium to fluoride is less than 2:1.

22. The process according to claim 21, wherein the molar ratio of potassium to fluoride is less than 2:1.

23. The process according to claim 20, wherein said catalyst composition contains less than 0.2 weight % potassium.

24. The process according to claim 23, wherein said catalyst composition contains 0.1 weight % potassium.

25. The process according to claim 20, wherein said silver component is selected from the group consisting of silver oxide and silver metal.

26. The process according to claim 20, wherein the palladium content is 0.01-1 weight %, the silver component is 0.01-10 weight %, and the fluorine content is 0.01-1.5 weight %; and

said highly unsaturated hydrocarbon is selected from the group consisting of acetylene, propadiene, 1,3-butadiene, 1,3-pentadiene, 1,4-pentadiene, isoprene, 1,3-cyclopentadiene, dicyclopentadiene, and mixtures thereof.

27. The process according to claim 26, wherein the palladium content is 0.01-0.2 weight %, the silver component is 0.01-2 weight %, and the fluorine content is 0.05-0.4 weight %.

28. The process according to claim 20, wherein said process further comprises the presence of a sulfur impurity.

29. The process according to claim 28, wherein said sulfur impurity is a sulfur compound selected from the group consisting of hydrogen sulfide, carbonyl sulfide (COS), carbon disulfide (CS_2), mercaptans (RSH), organic sulfides (R-S-R), organic disulfides (R-S-S-R), organic polysulfides ($R-S_n-R$, n where >2), thiophene, substituted thiophenes, organic trisulfides, organic tetrasulfides, and mixtures thereof, wherein R represents an alkyl or cycloalkyl or aryl group containing 1 carbon atom to 10 carbon atoms.

30. A selective hydrogenation process comprising introducing into a reactor, from a depropanizer fractionation tower, a fluid stream comprising a diolefin and acetylene, optionally in the presence of a sulfur impurity, with a catalyst composition under conditions effective to convert said diolefin and acetylene to their corresponding monoolefins

said catalyst composition comprises a palladium-containing material selected from the group consisting of palladium metal, palladium oxides, and mixtures thereof, a silver component, an alkali metal fluoride, and an inorganic support material;

said alkali metal fluoride is potassium fluoride and said inorganic support material is selected from the group consisting of alumina, silica, titania, zirconia, aluminosilicates, zinc aluminate, zinc titanate, and mixtures thereof;

said catalyst composition contains 0.01 to 1 weight % palladium, 0.005 to 2 weight % of a silver component, 0.05-0.4 weight % fluorine; and less than 0.3 weight % potassium;

said process is carried out at a temperature in the range of 30 to 200°C and under a pressure in the range of 15 to 2000 pounds per square inch gauge (psig).

31. The process according to claim 30, wherein a molar ratio of potassium to fluoride is less than 2:1.

32. The process according to claim 31, wherein the molar ratio of potassium to fluoride is 1:1.

33. The process according to claim 30, wherein said catalyst composition contains less than 0.2 weight % potassium.

34. The process according to claim 33, wherein said catalyst composition contains 0.1 weight % potassium.

35. The process according to claim 30, wherein said inorganic support material is alumina.

36. The process according to claim 30, wherein said sulfur impurity is a sulfur compound selected from the group consisting of hydrogen sulfide, carbonyl sulfide (COS), carbon disulfide (CS_2), mercaptans (RSH), organic sulfides (R-S-R), organic disulfides (R-S-S-R), organic polysulfides (R-Sn-R, n where >2), thiophene, substituted thiophenes, organic trisulfides, organic tetrasulfides, and mixtures thereof, wherein R represents an alkyl or cycloalkyl or aryl group containing 1 carbon atom to 10 carbon atoms.